

Compilation of comments received on ISO/CD 20100 Gaseous hydrogen — Fuelling stations	Date:2010-01-22	ISO/TC 197 doc. N 441 Annex A
		Reference document: ISO/TC 197 N433(ISO/CD 20100)

1	2	(3)	4	5	(6)	(7)
MB¹	Clause No./ Subclause No./ Annex (e.g. 3.1)	Paragraph/ Figure/ Table/ Note (e.g. Table 1)	Type of comment²	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted

UK	all		ge	The bulk of the UK comments, submitted during the last circulation, have not yet been addressed. It is necessary to evaluate how these comments are addressed in the document and have the opportunity to raise any additional comments that arise as a result of the work of the Task Groups.	Include the work of the WG 11 Task Groups prior to recirculation for comments. Provide a completed C of C from the previous circulation for comments.	
UK	all		ge	The UK agrees that there would be value in having an international document to address this topic. The UK has concerns that the inclusion of set-back distances that are not harmonised with either the distances used by participating countries or the methodologies used by participating countries may create additional confusion, rather than facilitating siting hydrogen stations. In addition it would be unwise to go ahead with publication when the results of a test programme on fuelling protocol is about to be reported and a great deal of effort is still underway to firm up on the safety distances.		
US 1	General		Tech	The CD does not include latest input from the two TGs that were established to address safety distance and dispenser protections.	Given these major short-comings, the US-TAG will re-evaluate acceptability of the document after the deficiencies noted have been addressed and incorporated into an updated draft.	
US 2	General		Tech	The change in scope relative to indoor fueling is not addressed.	Given this major short-coming, the US-TAG will re-evaluate acceptability of the document after the deficiency has been addressed and incorporated into an updated draft.	
AR	general comment hole document		Te	The material requirements are too general. There are lots of omitted ISO references, for example ISO 11114-1		
SC25 IN	1	Figure 1	Ed	Remove picture of Car and replace with text vehicle in the box	Hydrogen stations will be used by all vehicles	

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UK	1		ge	The scope now includes indoor non-public fuelling stations; however the document is lacking specific provisions for indoor fuelling. It would not be appropriate to apply the existing provisions for outdoor fuelling to indoor operations; therefore specific requirements for indoor fuelling must be developed and included, or this should be removed from the scope.	Clarify scope and if indoor fuelling is to be covered, add appropriate provisions throughout the document. This is not a trivial task.	
AR	3 Normative references		Ed	Reference for the ISO 16110 Part 2 is missing	Add the corresponding reference	
AR	3 Normative references		Ed	Reference to ISO 26142 is missing	Add the corresponding reference: ISO 26142 – Hydrogen detection apparatus – Stationary Applications.	
SC25 IN	3.6		Te	Specify designated temperature in relation to ambient temperature for better clarity in standard	Replace “designated temperature” by “ambient temperature”	
SC25 IN	3.15		Te	As the standard deals with Liquid Hydrogen stations as well, cryogenic definitions to be added	Add one definition for cryogenic temperatures and storage vessels	
AR	4.1		Te	For general design requirements a reference to hydrogen safety considerations given in ISO/TR 15916 should be made here	After the last sentence the following text shall be added: For complete technical reference on hydrogen safety consult ISO/TR 15916 – Basic considerations for the safety of hydrogen systems	
SC25 IN	4.1		Te	Axphyxiation hazard in case of leakage of gaseous H2 and cryogenic burns in case of contact with liquid H2	Add axphyxiation and cryogenic burn hazards in list of safety hazards	
US 3	5.1.1	5.1.1	te	The standard requires that fencing be at least 2 meters tall. Standard fencing in many areas is 6 feet tall (1.83 meters). Thus, compliance with the standard will necessitate the use of 7” extensions or nonstandard fabric. This is an added expense with little safety benefit.	Change the minimum fence height requirement to 1.8 meters.	
US 4	5.1.1	3	TE	Where fencing is provided to prevent access of unauthorised persons, the minimum clearance between the fence and the installation shall be 0,8 m to allow free access to and escape from the enclosure. What is the basis for 0.8 meters (2’8”)?	Since this is probably a key regulatory point, please stipulate a reference for the number. If none exists, is there something in NFPA 55, NFPA 37 or NFPA 853 that can be used to justify the value.	

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UK	5.1.2		te	The document doesn't specify the resistance between the surface of the fuelling pad and earth ground. There is concern that this is a significant oversight and that it should be specified at 1M Ω for global consistency in the grounding of the fuelling station pad.	Add requirement.	
SC25 IN	5.2		Te	Corrosion Protection to be given to tube trailers parked in open fenced parking lots	Add Corrosion Protection for tube trailers	
SC25 JP	5.2	3	te	Minimum clearance of 1m ... Reason: The reason why 1m necessary is not clarified and it is difficult to keep 1m clearance for all area from space restriction.	Minimum clearance of 0.5m	
SC25 JP	5.2	10	te	The storage area shall be fenced to prevent access of unauthorised person. Reason: In case of inside facility station, fence would be avoidable to minimize construction expense.	The storage area shall be managed to prevent access of unauthorised person.	
US 5	5.2	3	TE	Minimum clearance of 1 m shall be maintained on all sides of each tube trailer or MCP. What is the basis for 1 meters (3'4")?	Since this is probably a key regulatory point, please stipulate a reference for the number. If none exists, is there something in NFPA 55, NFPA 37 or NFPA 853 that can be used to justify the value.	
US 6	5.3.1	4	TE	Any firebreak walls or partitions shall be made of brick, concrete or any other suitable non-combustible material of 90 minutes rating. Where is the fire rating defined?	Since this is probably a key regulatory point, please stipulate a reference for the number.	
US 7	5.3.1	8	TE	Dykes, diversion kerbs or grading shall be used to ensure that liquid leakage from adjacent combustible liquid storages installed at a higher level than the liquid hydrogen storage, is prevented from accumulating within 15 m of the liquid hydrogen storage. What is the basis for 15 meters (~50')?	Since this is probably a key regulatory point, please stipulate a reference for the number.	

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US 8	5.3.1	8	TE	I would expect that the concern is pooling and uncontrolled flow	Amend to caution about pooling and to instruct to channel away from other hazards (ignition) and uncontrolled flow paths (sewers, basements, etc)	
US 9	5.3.2	5	TE	This was mentioned previously revision, there sound be an ESD requirement for the receiving pad. Possible requirements like NFPA 77.	Add requirements.	
US 10	5.3.4	2	TE	Liquid hydrogen delivery lines shall include a non-return valve or an emergency isolating device preventing outflow in case of hose rupture. What hazard is being address? Is it flow from the tanker to ambient or flow from the storage facility to ambient? Both are real and need to be addressed.	Address flow from both the tanker and the storage facility on a hose failure.	
UK	5.3.5		te	There is no requirement specified to fit flame arrestors on vent pipes. If flame arrestors are used, what requirements should be met?	Add requirement or guidance in the case that someone desires the use of flame arrestors.	
US 11	5.3.5	0	TE	Pressure relief devices (PRD) come in a number of flavors. The term is typically used for Temperature actuated Safety Devices located on gas cylinders. This leads to confusion. Different relief devices are: <ul style="list-style-type: none"> • PSV – Pressure actuated Safety relief Valves like ASME “UV” valves. • PSD – Pressure actuated Safety relief Devices like ASME “UV” burst discs. • TSV – Temperature actuated Safety relief Valves like bimetallic strip valves. • TSD – Temperature actuated Safety relief Devices like sprinkler heads. 	Be specific in the terminology. In this case, I believe we are referring to PSV and PSD components.	
US 12	5.3.5	2	TE	The clause cautions about moisture freezing. However, there is no caution to avoid placement where the device is exposed to liquid air.	Add a caution on liquid air, and liquid N2 with locally high concentrations of gaseous O2.	

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US 13	5.3.5	4	TE	Safety valves shall comply with ISO 21013-1. Bursting disks shall comply with ISO 21013-2. Sizing and capacity determination of safety valves and bursting disks shall meet the requirements of ISO 21013-3.	Add ...comply with ISO 21013-1 or other nationally or internationally recognized requirements... comply with ISO 21013-2 or other nationally or internationally recognized requirements... This would allow "UV" valves. BPVC Sect VIII UG-126 and 127 respectively.	
US 14	5.3.5	4	TE	Bursting disk material shall be compatible with hydrogen. Bursting disks shall be replaced every five years.	PSV and PSD materials shall be compatible with hydrogen. PSVs shall be tested, at a minimum once every 5 years or as required by nationally recognized requirements (NBIC), whichever is less. PSDs shall be replaced, at a minimum once every 5 years or as required by nationally recognized requirements (NBIC), whichever is less.	
SC25 IN	5.3.6		Te	Minimum Height of vent stack must be specified and proximity to combustion sources to be avoided.	Specify minimum height of Hydrogen vent stack	
US 15	5.3.6		TE	Requirements are insufficient to prevent a potential hazard.	Add caution about water/ice build up. Suggest review or reference of CGA G5.5 – It is very clear on the "hows and whys".	
US 16	5.3.8	1	TE	Foundations and sumps for cryogenic pumps shall be designed and constructed to prevent frost heaving. Do we want sumps to allow the pooling of liquid hydrogen? Will the sump lead to a sanitary drain?	Prevent the use of sumps.	
AR	6.2.2		Te	Hydrogen generators using fuel processing technologies shall meet the requirements of ISO 16110-1. But in addition part 2 of the standard also shall be taken into consideration	Hydrogen generators using fuel processing technologies shall meet the requirements of ISO 16110 Parts 1 and 2	

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US 17	6.3	1	TE	During normal fuelling system shutdown, the hydrogen generators using water electrolysis process and the hydrogen generators using fuel processing technologies shall not rely on safety devices to shut down.	Suggest that this be re-phrased: The hydrogen generators using water electrolysis process and the hydrogen generators using fuel processing technologies shall not rely on safety devices to perform normal shut downs.	
US 18	6.3	2	TE	This requirement may be unnecessarily restrictive: Actuation of any emergency shutdown device of the fuelling station shall shut down the hydrogen generators using water electrolysis process and the hydrogen generators using fuel processing technologies.	Actuation of any emergency shutdown device on the fuelling station shall result in the isolation of flow to and from the skid in alarm. The individual controllers for the other skids should assess and respond accordingly unless there is a site-wide emergency that justifies deactivation or shutdown of other skids.	
UK	7		te	There appears to be no reference to the standard of isolation required. e.g., Section 7 of the DTS refers to Hydrogen Compressors and maintenance. Is it acceptable to rely on a single isolation for maintenance when compressors in parallel are running and a single compressor is being worked on, or are double isolation valves and vent required?	Clarify required isolation.	
SC25 IN	7.1		Te	Hydrogen compressors should be flame proof	Specify fire retardant coatings for compressors.	
SC25 JP	7.1	3	te	Where compressors are installed for operation in parallel, each discharge line shall be equipped with a check Valve. Reason: The reason why a check valve should be equipped is not clarified and unnecessary expense would be minimized.	Delete this sentence.	
SC25 JP	7.2	2	te	Vibration shall be not more than 20mm/s and shall be monitored. Reason: Only monitoring causes no action and unnecessary expense would be minimized.	Vibration shall be not more than 20mm/s.	

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US 19	7.2	2	TE	This requirement is an incomplete and appears arbitrary: Vibration shall be not more than 20 mm/s and shall be monitored.	Delete or fix.	
US 20	7.4		TE	There should be a required separation distance. What is the definition of 2 hr fire resistance?	Review NFPA 37 and 853 for minimum separation distances and stipulate as minimum requirement. Review NFPA 1 for definition of 2 hr fire resistance and stipulate as minimum requirement.	
US 21	7.5		TE	Compressor enclosures that are large enough to admit service personnel shall have an access door that opens outwards. If the access door is equipped with a latch, it shall be equipped on the inside with fast release hardware that can be operated without a key. This assumes doors swing. Doors also slide or roll up.	Change to prohibit opening inward.	
US 22	7.6.7		TE	Where the motor and auxiliary equipment are pressurized by an inert gas such as nitrogen, low pressure/flow shall be indicated by an alarm, which shall be arranged to shut down the motor and auxiliaries. This is in standards. Refer to the standards.	Reference NFPA 496 and the IEC 60079-2 (?)	
AR	10		Te	10 Gaseous hydrogen buffer storage tanks Buffer storage vessels for the storage of hydrogen gas shall be manufactured according to ISO 16528-1.	If gas cylinders are used for buffer storage they should be manufactured according to ISO 9809.	
AR	10		Te	If gas cylinders are used for buffer storage they should be manufactured according to ISO 9809.	Add the following sentence: If gas cylinders are used for buffer storage they should be manufactured according to ISO 9809.	
UK	11		te	There is a testing program sponsored by 6 major vehicle manufacturers and energy companies that is underway to establish the fuelling protocol, which will finish by December of this year. The DTS should include the protocol so that vehicles could use fuelling stations safely on a global basis.	Include agreed fuelling protocol.	

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US 23	11		Tech	Section 11 does not include latest input from TG2.	The US-TAG will re-evaluate the situation after input from TG2 is incorporated in the draft.	
US 24	11.1	1	TE	Dispensers shall be located outdoors. Dispensers shall not be located beneath a canopy nor within 0,9 m of the vertical projection of the canopy to the island, except where the canopy is not capable of accumulating gas in pockets or between the canopy ceiling and roof. Gasoline and natural gas is currently dispensed indoors in a number of cities including NYC. A prohibition is not acceptable.	Dispensers shall be located in a properly ventilated area. Outdoor dispensers shall not be located beneath a canopy nor within 0,9 m of the vertical projection of the canopy to the island, except where the canopy is not capable of accumulating gas in pockets or between the canopy ceiling and roof.	
UK	11.3		te	Need to consider the possibility of hydrogen heating up when being compressed, a consequence is that the pressure in the vehicle tank will increase and the temperature will also rise. The filling station controls and equipment design conditions will need to recognise these conditions and compensate accordingly. Specified equipment design conditions will also need to reflect these operating conditions.	Add language to section 11.3 to address this issue.	
AR	11.3.2		Te	Hydrogen sensors and monitoring systems should comply with the appropriated ISO standard	Add the following sentence after the last paragraph: Hydrogen sensors and monitoring systems shall comply with ISO 26142 – Hydrogen detection apparatus – Stationary Applications.	
SC25 JP	11.3.2	10	te	This can be done by a gas detector installed within the dispenser cabinet set to Reason: In case of well self ventilated outside cabinet, gas detector would not be necessary from cost stand point.	Delete this sentence.	
US 25	11.3.2	1	TE	The cabinet design should have a minimum IP rating (protection rating).	Select a minimum IP rating per EN 60529	

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US 26	11.3.2	8	TE	<p>Fail-safe means shall be provided to detect any leak which could lead to an explosive atmosphere inside the dispenser cabinet. This can be done by a gas detector installed within the dispenser cabinet set to interrupt the gas supply when it detects a volume fraction of hydrogen in air greater than approximately 1 % (20 % of the LEL of an hydrogen-air mixture), or by means of frequent pressure integrity checks as indicated in 11.7.3.</p> <p>Errata – CNG numbers NASA 1740.16 clause 203e indicates the LEL as ~18.3% in ambient air.</p>	Use 25% of LFL	
SC25 JP	11.4.1	10	te	<p>The length of the fuelling hoses shall not be more than 5m and not less than 3m.</p> <p>Reason: The reason why maximum length 5m is not clear and 6m hoses would be permitted for easy access to vehicle and addition of emergency release connector.</p>	The length of the fuelling hoses shall not be more than 6m and not less than 3m.	
JP2	11.4.1		TE	<p>The hose is “prevented from contacting the ground”(p 20, line 1)</p> <p>In contrast to this rule, line 8 says “the length of the fuelling hoses shall be not more than 5 m and not less than 3 m.”</p> <p>If 5 m, the hose may contact the island or the ground.</p>	<p>Please add the following:</p> <p>If the hose is protected from damage by such means as wrap-around metal springs or resin protector, no special structural considerations are required for preventing the hose from ground contacts.</p>	
JP3	11.4.1		TE	<p>Re: Fuelling hoses shall only be used only downstream of.... (p 20, line 7)</p> <p>Conventional emergency and isolation shut-off valves are fixed on one side and connected to a hose on the other. But the pull-out type that has a hose on both sides should be included. (Gasoline dispensers all have pull-out decoupling devices with a hose on both sides.)</p>	If the emergency decoupling device so allows, the device may be connected to a hose on each side.	
US 27	11.4.1	6	TE	<p>Some clarification is needed:</p> <p>The construction material shall provide resistance to permeation. Where outer sleeves are fitted, they shall be suitably pierced to prevent inflation.</p>	The construction material shall provide resistance to permeation. The permeation rate shall be a function of the liner selection. The reinforcement and cover layers shall not amass or retain hydrogen.	

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US 28	11.4.1	8	TE	Some clarification is needed: The fuelling hose assembly shall be constructed so as to provide an electrically conductive path between couplings at each end of the fuelling hose in order to dissipate static electricity.	The hose ends shall be bonded and the liner shall be either conductive or electro statically dissipative to prevent the generation of a static charge while flowing fuel. We need some definition here on ESD – maybe from the TFE hose definition (100R14B) in SAE J517.	
US 29	11.4.1	10	TE	The fuelling hose outer sleeves shall be constructed of non-electrically conductive materials. Why? We want the operator to be at earth ground prior to operating.	Delete.	
US 30	11.4.1	12	TE	Include a caution that tags applied to the hose should not adversely affect the hose (chafe, trap gas, etc)		
US 31	11.4.1	new	TE	Should there be a requirement on touch temperature of the hose?		
JP4	11.4.2		TE	P20 line 3 from the bottom “For design pressures in excess of 4 MPa, assembled fuelling hoses should be provided with a suitable restraining cable or device fitted to an anchor point to restrain hose movement in the event of a fuelling hose assembly failure such as,”	It is difficult to visualize what types of anchoring or restraining are meant by this provision. Please be a little more specific.	
US 32	11.4.2	new	TE	Should there be a prohibition to hose designs using tapered threads and a requirement to have a means to avoid unintentional detachment from the dispenser or the nozzle?		
US 34	11.4.2	4	TE	Specification of “soap suds” is inadequate and could lead to material problems.	A suitable, chloride-free, leak detection fluid.	
US 33	11.4.3	2	TE	Should the label include the name or logo of the certifying body?		

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US 35	11.5		TE	Why isn't the ISO and SAE nozzle standards referenced? This section has the potential to add or delete requirements on the nozzle.	Refer to the nozzle standard and delete the rest. If the working group wants to add additional requirements on the nozzle – add to the nozzle standard.	
US 36	11.6.2			Should the label include to name or logo of the certifying body?		
JP5	11.7.1		TE	11.7.1 describes the filling pressure and temperature relationship based on SOC. The values prescribed mean the filling is done at the vehicle tank temperature of 85 degrees C and the filling pressure of 7.5 MPa. That represents overfilling under our current national regulations. We can't accept it.	Add the following: If the filling temperature and pressure based on SOC are not allowed for vehicle fuel tanks under the national regulations, the maximum filling pressure and temperature may be set in accordance with the applicable national regulations.	
US 37	11.7.1		TE	Why is 25 MPa ignored?		
US 38	11.7.4		TE	Metering must meet the requirements of the authority having jurisdiction.	Note this requirement.	
SC25 JP	11.8.2	2	te	The pressure shall be measured by 2 independent pressure transmitters, Reason: To minimize unnecessary expense.	The pressure shall be measured by pressure transmitters,	

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US 39	11.8.2		TE	A pressure relief valve on the dispensing line shall prevent over-pressurization of the vehicle storage. This pressure relief valve shall have a set pressure not greater than 135 % of the nominal working pressure of the vehicle compressed hydrogen storage tank.	Consider following additions and corrections or add reference to general section of PRDs: PSVs shall comply with ISO 21013-1 or other nationally or internationally recognized requirements... and PSDs shall comply with ISO 21013-2 or other nationally or internationally recognized requirements. Note: This would allow "UV" valves. BPVC Sect VIII UG-126 and 127 respectively. Protective relief valve for dispensing may be on dispensing or one upstream source. Relief valves should be set to a pressure not greater than 140%.	
SC25 JP	11.8.3	1	te	The dispensing system shall be equipped by 2 independent temperature transmitters. Reason: To minimize unnecessary expense.	The dispensing system shall be equipped by temperature transmitters.	
US 40	11.8.3		TE	The dispensing system shall be equipped by 2 independent temperature transmitters; the fuelling station shall terminate immediately the refuelling process if a deviation on temperature is detected. This requirement is confusing. I think the requirement is to have redundant temperature measurements to avoid a single point failure. If so, it is not just the transmitter, but the entire circuit.	Clarify the requirement.	
US 41	11.8.4		TE	Suitable means shall be provided upstream of the fuelling hose so as to limit the release of gas in the event of an uncontrolled increase in gas flow. The dispensing system shall detect a major gas release caused by a filling fuelling line break and immediately shut down the refuelling process by means of actuated fail safe isolation valves.	Change "filling" to "fuelling".	

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US 42	11.8.4		TE	Should there be a requirement that the nozzle can be removed from the receptacle in the case of an ESD? An ESD is not necessarily due to the vehicle and if doesn't involve the vehicle should the option to move the vehicle out of harms way be viable?	Consider as part of TG2 improvements.	
US 43	11.8.5	2	TE	A manual ESD activation means shall be provided at a location remote from the dispensing area. It shall be placed at 1,80 m above forecourt level and clearly identified. Additional manual ESD activation means shall be placed inside the fuelling station office and in compressor and storage areas. 1.8 m (72") sounds excessive and not handicap accessible.	Consider as part of TG2 improvements.	
US 44	11.8.5		TE	Is there a requirement for the ESD to be able to manually or remotely reset? Reset by authorized personnel?	Consider as part of TG2 improvements.	
JP6	12		TE	One shall avoid cross-contamination of these fuels at a dispenser.	Add the following after the last sentence; "Appropriate measures shall be taken to prevent cross-contamination of these fuels."	
US 45	12		TE	Why are these grades listed?	The refuelling station shall distribute gaseous hydrogen that meets the minimum requirements noted in ISO 14687-2.	
SC25 IN	13		Te	Hydrogen stations should be well ventilated	Add ventilation clause in hydrogen station layout	
UK	13		ge	Section 13 refers to the layout of the refuelling station. Requirements given here could be more comprehensive. Guidance on aspects of safe traffic movement e.g., movement of hydrogen tankers and the need to provide layouts which avoid the need for the tanker to reverse, the ability of vehicles to move quickly out of the way in an emergency are needed.	Add guidance.	
US 46	13	6	TE	Statement is not complete: Hydrogen installations shall be kept free of vegetation.	Hydrogen installations shall be kept free of vegetation, debris and other flammable waste.	

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UK	13.2/ Annex	Table 1, Table 2, Table 3, Table 5 Annex	te	The safety distances in the document seem to have been determined by surveying several other documents (NFPA 55, NFPA 52, etc.). Analysis performed to validate the distances selected has not been provided in sufficient detail to facilitate proposals to NFPA and others to harmonise the numbers. Using these distances will cause this specification to be in conflict with many other standards, codes and regulations. Additionally, a great deal of work is being performed to more scientifically determine these safety distances. NFPA 2 (and other codes) will be adopting these distances when the reports are published. This will lead to conflicting requirements between published codes and standards and ISO 20100. Include the Task Group work prior to recirculation for comments.	Provide detailed annex that includes data and rationale for the distances used in the document. Include the Task Group work prior to recirculation for comments. Add information to Annex to demonstrate the various approaches considered by TG 1, and show how these approaches all converge on the same set of distances. This will add credibility to the numbers and facilitate harmonisation by allowing different analytical approaches to be used to get to the same set of distances.	
JP1	14		TE	ISO guidelines for global relevance does allow national deviations. Japan therefore requests to get its safety distance specifications described in an Informative Annexes. By presenting national deviations of other countries as well, the document will be a practical and useful international standard.	Annex (Informative) National Deviations on Safety Distance In Japan, the safety distance for hydrogen stations shall be as described in 7.3 Technical criteria for specific compressed hydrogen gas fuelling stations, General Compressed Gas Safety Regulations. In the United States of America..... In Germany..... So on and on	
US 47	14		Tech	Section 14 does not include latest input from TG1.	The US-TAG will re-evaluate the situation after input from TG1 is incorporated in the draft.	
UK	14.2	Table 1	ed	Last row refers to sect xxx. This should read "Section 11.4.3"	Correct reference in Table 1to read "Section 11.4.3".	
AR	14.2.2.1.1		Ed	The categories and their boundaries are displayed in Fig 2 not in Fig 1	Change Fig 1 by Fig 2 which is correct	
US 48	14.2.2.1.1		ED	Where is the Equation?		

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US 49	14.2.2.1.1	Table 1	ED	Hoses only used to connect transportable containers for the supply of hydrogen, operated and maintained in accordance with sect xxx	Complete sentence.	
SC25 IN	14.2.3		Te	Safety distance to be specified	Replace "XX" with some value.	
UK	14.2.3		te	Complete the requirement "No safety distance shall be reduced by more than XX % (tbd) through such an adjustment."	Fill in the agreed percentage for review and comment.	
US 51	14.2.3		ED	There are a number of XX's in the text.	Correct text	
US 50	14.2.3 b)		Te	It does not appear that this CD is completed as there is a "TBD" in the separation distances section. Unless information can go into this section, I am not sure that this document is ready.	Fill in the missing information and when doing so, make sure that it does not conflict with other codes and standards addressing hydrogen refuelling.	
UK	14.2.4		ed	Incomplete reference "Leak detection and isolation measures complying with the requirements of section xxx may allow reducing the safety distances for the exposures listed in Table 4."	Fill in the appropriate reference.	
UK	14.2.6		te	Incomplete requirements: "This fire barrier shall have a minimum fire resistance rating of 90 minutes. It shall be designed to withstand an impulse of XX and an overpressure of YY."	Fill in agreed numbers for review and comment.	
US 52	15.6	1	TE	Enclosures that rely on active ventilation for protection against accumulation of ignitable mixtures as per 15.4 shall be purged with a minimum of 5 air changes prior to the energization of any devices that are not suitable for the area classification. This is a PFA number. Use a value that can be traced to an accepted code.	Use 4 volume changes. This is consistent with CSA B149.3 clause A.8.2.1. the Canadian Code for Fuel related appliances and equipment.	
AR	15.8		Te	Hydrogen detection systems shall be in agreement with ISO 26142	Add the following sentence after the NOTE 2: Hydrogen detection systems shall comply with ISO 26142	

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UK	16	16	te	Section 16 refers to General Equipment Requirements but there appears to be no references to quality standards for pipe work fabrication.	Add references for quality standards for pipe work fabrication.	
US 53	16.2.7		TE	Pressure relief devices.	Consider following additions and corrections or add reference to general section of PRDs: PSVs shall comply with ISO 21013-1 or other nationally or internationally recognized requirements... and PSDs shall comply with ISO 21013-2 or other nationally or internationally recognized requirements. Note: This would allow "UV" valves. BPVC Sect VIII UG-126 and 127 respectively.	
US 54	16.4.8	3	TE	Portions of wall less than 3 m (measured horizontally) from any part of a system shall have a fire resistance rating of at least 1 hour.	Review NFPA 1 for definition of 2 hr fire resistance and stipulate as minimum requirement.	
US 55	17.1.2	2	TE	Why isn't the NASA, API or ASME documents noted. ASME B31.12 is a published H2 piping code.		
US 56	17.3			Pressure relief devices.	Consider following additions and corrections or add reference to general section of PRDs: PSVs shall comply with ISO 21013-1 or other nationally or internationally recognized requirements... and PSDs shall comply with ISO 21013-2 or other nationally or internationally recognized requirements. Note: This would allow "UV" valves. BPVC Sect VIII UG-126 and 127 respectively.	
US 57	21.4		TE	Vents	Refer to CGA G-5.5 for acceptable vent design requirements	
US 58	22.2		GE	FYI – IP56W is wire access <1mm, powerful water jets and suitable for specified weather conditions		

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US 59	23.1	3	TE	<p>Hydrogen sub-systems, interconnection and the whole system should be leak tested by a mixture composed of nitrogen and a minimum volume fraction of 5 % helium. For a flange, the helium detector shall be moved at a perpendicular distance of 2 – 3 cm from the flange all around.</p> <p>Why 5% He? It might not detect the leak.</p>	<p>Use 5% H₂ in N₂. This is equivalent to forming gas. It is non-flammable and should be readily available. It is used as blanket gas in a number of annealing processes and might be on hand anyway if a post weld heat treat is required as part of the fabrication process.</p>	
UK	Annex		ge	<p>The requirements give in the document and understanding arising from it would be significantly enhanced by the inclusion of diagram's such as:</p> <ul style="list-style-type: none"> * Layout sketches illustrating minimum safety distances as given in the tables. * Flammable hazardous area diagrams showing typical zones. * Simple flow diagram's showing typical set ups for vehicle refuelling stations and storage, equipment, features such as relief devices, emergency and manual shutoff valves and control valves. Isolation for maintenance required between the various sections of the system. * Positions of bollards and zones for emergency response. 	Add diagrams.	
AR	Bibliography		Ed	<p>Numbering in bibliographic references is not usual nor needed in this document</p>	<p>Numbering should be eliminated and references should be ordered alphabetically</p>	